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LETTER TO THE EDITOR

Creativity in large pharmaceutical research organizations: unleash the hungry drug hunter

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Productivity remains a critical issue for the pharmaceutical industry and biomedical research, as illustrated by the low number of new molecular and biological entities that were approved in 2016 (Mullard, 2017). The failure rate in drug discovery programmes is high, and the returns on small-molecule R&D remain below their capital costs (David *et al.*, 2009). The quest for a new paradigm that would radically change the pharmaceutical industry and create a high-performance R&D organization remains a major goal.

Many solutions have been proposed to tackle the problem of productivity in pharmaceutical R&D, but it is striking that little attention has been paid to perhaps what can be considered as the primary culprit of the pharma R&D crisis: the lack of scientific creativity. This is particularly annoying in an era of highly innovative medicines, which progressed from the less demanding era of 'me-too' or 'slightly-me-better' drugs (Swinney and Anthony, 2011). Research in the drug discovery industry is performed by scientists whose creativity and passion for science are the impetus for innovation. In an attempt to understand what drives major differences in productivity, Edwards *et al.* (2011) and Ringel *et al.* (2013) identified a core set of behaviours as critical success factors, among which talent, as measured by publication productivity (e.g. *h*-index; Hirsch, 2005), is strongly correlated with laboratory performance. Talented scientists act as boundary spanners, coupling seemingly disparate fields and extracting new sources of information, and they are proficient at gathering external knowledge. A recent study that explored the pharmaceutical R&D dynamics by examining the publication activities of all R&D laboratories revealed a marked decline in the total number of publications by large firms (Rafols *et al.*, 2014). While this observation confirms the increasing reliance of pharma on external research, it also emphasizes that less (quality?) science is performed in R&D laboratories, perhaps due to a shortage of talent, a phenomenon that further illustrates the decline in big pharma's R&D.

Talent is necessary, although it is not sufficient to assure success. Drug discovery research thrives in a creative, flexible, non-autocratic corporate environment (Cuatrecasas, 2006), in which proper managerial strategies, along with fully empowered key research leaders, are employed to guide and inspire scientists. Such an environment includes biotech- or academic-style research projects that 'put scientists in the driving seat' (Zhong and Moseley, 2007), while keeping the requirement of experimental rigour, which is more prominent in big pharma (Ehlers, 2016).

The (success) stories of the pioneering biotech companies, Genentech and Vertex Pharmaceutical, are probably the best illustration of how great innovation thrives with a mixture of outstanding research leaders (Herbert Boyer and Joshua Boger, respectively), highly focused groups of committed talented young scientists and visionary neck-exposed risk takers (Bob Swanson for Genentech), these latter creating an environment that supports disruptive science. These biotech companies grew spectacularly quickly because they pushed the boundaries of what is possible in medicine and delivered genuine clinical breakthroughs by translating highly innovative scientific research (e.g. recombinant DNA technology, crystal structure for the protease of the hepatitis C virus and rational drug design) into drugs that have brought substantial benefits to patients (human insulin and growth hormone, protease inhibitors). While today these companies are much larger (Genentech is a Roche company), they have kept their unique culture of relentless commitment to science. A recent analysis of R&D productivity in pharma

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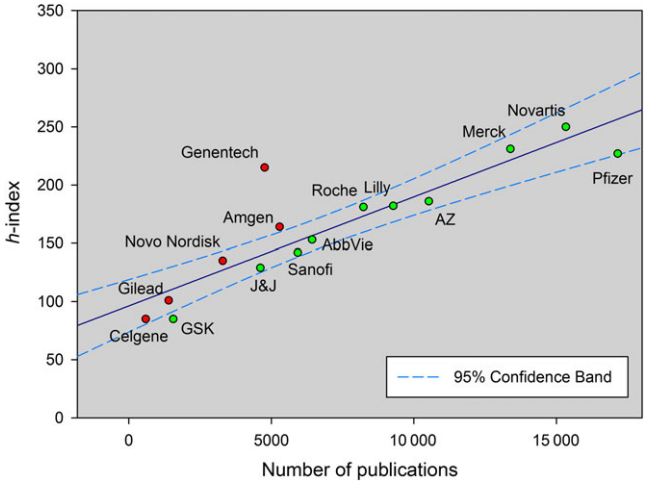

Figure 1

Productivity and impact of the published work of top biotech (red dot) and top pharma (green dot) companies. The graph shows the number of scientific publications (productivity factor) from 2005 to 2015 and the related *h*-index (impact factor) and a plot showing the estimated regression line along with the confidence band. Pearson's correlation analysis showed that the *h*-index is significantly and positively correlated with the number of publications ($r = 0.90$, $P < 0.001$). While the majority of companies are within the 95% confidence band, Genentech is clearly an outlier because of the higher impact of its scientific publications. AZ, AstraZeneca; GSK, GlaxoSmithKline; J&J, Johnson & Johnson. Note: the *h-index* attempts to measure both the productivity and impact of the published work of an author, an institution or a company. For example, in the case of Genentech, an *h-index* of 215 means that out of the total number of publications (i.e. 5538) selected to produce the graph, 215 of them have been cited at least 215 times. Source: www.scopus.com.

identified Genentech as the most productive company, generating the highest number of successful drugs at a given level of R&D expenditure than any of the other top 20 pharmaceutical firms (Tollman *et al.*, 2016). The R&D productivity of Genentech is also reflected in their number of scientific publications submitted, which is the second highest among biotechs, but more importantly their *h*-index is the highest of all biotechs (Figure 1).

Pharma executives should be aware that the best way to solve the productivity problem is to return power to researchers. This does mean not only disbanding the silos and severing large groups into more functional smaller highly focused groups led by people who are leaders in their scientific fields, but also promoting the development of an accompanying talent strategy for their scientific workforce. As mentioned in a critical opinion article on the big pharma productivity crisis, there are many great scientists in pharmaceutical research organizations just 'waiting to be unleashed' (Booth, 2013) and ready to go the extra mile.

Conflict of interest

The author declares no conflicts of interest.

References

Booth B (2013). Culture as a culprit of the pharma R&D crisis. *Life Sci VC*. Available at: http://lifescivc.com/2012/04/culture-as-a-culprit-of-the-pharma-rd-crisis.

Cuatrecasas P (2006). Drug discovery in jeopardy. J Clin Investig 116: 2837–2842.

David E, Tramontin T, Zemmel R (2009). Pharmaceutical R&D: the road to positive returns. Nat Rev Drug Discov 8: 609–610.

Edwards M, Tramontin T, Simon D, Dhankhar A, Sheikh M (2011). Managing the health of early-stage discovery. Nat Rev Drug Discov 10: 171–172.

Ehlers MD (2016). Lessons from a recovering academic. Cell 165: 1043–1048.

Hirsch JE (2005). An index to quantify an individual's scientific research output. Proc Natl Acad Sci 102: 16569–16572.

Mullard A (2017). 2016 FDA drug appovals. Nat Rev Drug Discov 16: 73.

Rafols I, Hopkins MM, Hoekman J, Siepel J, O'Hare A, Perianes-Rodriguez A *et al.* (2014). Big pharma, little science? A bibliometric perspective on big pharma's R&D decline. Technol Forecast Soc Change 81: 22–38.

Ringel M, Tollman P, Hersch G, Schulze U (2013). Does size matter in R&D productivity? If not, what does? Nat Rev Drug Discov 12: 901–902.

Swinney DC, Anthony J (2011). How were new medicines discovered? Nat Rev Drug Discov 10: 507–519.

Tollman P, Panier V, Dosik D, Biondi P, Cuss F (2016). Organizational effectiveness: a key to R&D productivity. Nat Rev Drug Discov 15: 441–442.

Zhong X, Moseley GB III (2007). Mission possible: managing innovation in drug discovery. Nat Biotechnol 25: 945–946.